8. Summary of the cycle of conference presentations

Urban exposome assessment: Lessons learned from the EXPANSE Project

Apolline Saucy

The exposome concept emerged in the early 2000s to recognise the importance of the sum of all the non-genetic factors that can affect health across the life course. With the development of powerful computers and satellite imagery, tools have been developed that can describe exposure to the external exposome (e.g. air pollution, green spaces, etc.) and these are being integrated into a growing number of large-scale, population-based cohort studies. As more and more of the world's population live in cities, the EXPANSE Project – EXposome Powered tools for healthy living in urbAN SEttings – aims to address one of the most pertinent issues for urban planners, policymakers, and European citizens: "How can we improve our health and well-being in a modern urban environment?".

The first task initiated by EXPANSE was to characterise the living environment across European countries using harmonised indicators with a high spatio-temporal resolution. For example, models were developed to estimate daily NO_2, O_3, PM_{10}, and $PM_{2.5}$ concentrations at 25 × 25 m resolution for the European region. Smaller-scale aspects of the living environment can also affect lifestyle and health, including, for example, the food environment (e.g. distance to shops, fast-food restaurants, etc.) and other neighbourhood-specific qualities (e.g. walkability, availability of parks and green spaces).

Combining these dimensions of the external exposome helps us understand the spatial distribution of environmental stressors across different groups of the population. For example, by evaluating relocation trajectories of adults and families as they move home, we found that socioeconomic characteristics but also household and family composition are important determinants of the choice of

new neighbourhoods and that privileged groups are more likely to relocate to "healthier" environments and experience positive health outcomes. Overall, despite increasing evidence of the central role of social determinants and life stages as important contributors to health, efforts and tools to integrate the social environment as a central part of the external exposome remain scarce and insufficient. A systematic integration of these factors in large-scale cohort studies and exposome research should gradually alleviate social inequities in health and mitigate the emergence of new inequalities.

The chemical context of the exposome

Joan Grimalt

The exposome constitutes an inventory of the plethora of exposures to synthetic chemicals, dietary components, psychosocial stressors, and physical factors, as well as their biological responses that might impact human health. This talk outlines the main physico-chemical characteristics that determine the potential toxicity of environmental contaminants and discusses the environmental equivalence of Paracelsus' adage: "the dose makes the poison", considering the effects of chronic exposure to low concentrations of contaminants over long periods or an entire lifetime. The increasing incidence of various non-infectious diseases and their possible relationship with environmental contaminants are also examined. The talk concludes by lending support to the proposal currently under debate at the United Nations, as promoted by some 20 researchers and supported by about 2,000 more, to establish an international panel on chemical contaminants and residues.

An overview of 10 years of early-life exposome research

Léa Maitre

Chemical pollution, characterised by the shift from traditional pollution (e.g. wood stoves) to modern pollution (e.g. lead and air pollution), represents an enormous burden for human health worldwide. Current technologies to monitor pollution of this type are, however, manifestly underperforming: most organic constituents of biological and environmental samples go unidentified and potential chemical stressors are disregarded. The exposome seeks to change the dominant paradigm and shift the focus in disease aetiology to the environment, escaping the genocentrism of the Human Genome Project.

Early-life exposome research at ISGlobal has been conducted in existing birth cohorts. This talk examines the application of interdisciplinary research – omics,